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EFFECTS OF TEXO #502AF

AND PENNSALT CLEANER #44

PAINT STRIPPERS ON

COMMONLY USED AIRCRAFT MATERIALS

REPORT A074 SERIAL NO. 4

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EFFECTS OF TEXO #502AF

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INDEX (Alwt-3,6)(IV-a)(Mg-1)(IV-a)

CODE (FeL-1, Plat-2)(IV-a)

(FeuH-3)(I-d,h,k)(IV-a)

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STRUCTURES LABORATORYFINAL REPORTEFFECTS OF TEXO NO. 502AF AND PENNSALT CLEANER NO. 44
PAINT STRIPPERS ON COMMONLY USED AIRCRAFT MATERIALSABSTRACT

Epoxy paint used on F4H detail parts is presently being stripped by hand. Because of increased epoxy paint requirements, tank stripping operations are urgently needed to eliminate costly hand stripping. Therefore, it is necessary to determine if the proposed tank type paint strippers have any deleterious effects on materials they will contact.

Test panels and tensile strength specimens were immersed in the paint strippers under conditions simulating operating conditions. Panels were checked for weight change, discoloration, and evidence of corrosion. The panels were then placed in the salt spray, in accordance with Method 811.1 of Federal Test Method Standard 151, using a 20% salt solution.

Tensile strength specimens were used to determine if either paint stripper caused hydrogen embrittlement of high heat treated steel.

The Texo No. 502AF is not practicable because of the residue it leaves.

The Pennsalt Cleaner No. 44 slightly impaired the corrosion resistant properties of anodized aluminum and a definite impairment on the corrosion resistant properties of alodined aluminum was observed. The Pennsalt Cleaner No. 44 did not change the corrosion resistant properties of sealed and unsealed cadmium plated steel.

Neither paint stripper caused hydrogen embrittlement of high heat treated steel.

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FINAL REPORT**1. OBJECT**

To determine if Texo No. 502AF or Pennsalt Cleaner No. 44 are corrosive to commonly used aircraft materials and adversely affect the chemical surface treatments or platings, or cause hydrogen embrittlement of high strength heat treated steel.

2. SPECIMEN PREPARATION

The panels, measuring 6.0" x 2.5" x 0.040", were prepared and chemically treated or plated as shown in Table 1, page 6, of this report. The panels designated "5C" were anodized in Building 27 and sealed in the Laboratory with distilled water at 200F.

The tensile strength specimens were prepared as shown in Figure 1, page 23, of this report.

3. TESTING PROCEDURE

The corrosion test panels were cleaned by boiling one minute in C.P. isopropanol and one minute in C.P. benzene, and were immediately weighed.

Three panels from each group were then placed in each type of paint stripper, as shown in Table 3, pages 12-16. The Texo No. 502AF paint stripper was tested at room temperature for eight hours and the Pennsalt Cleaner No. 44 was tested at 180F for eight hours.

After immersion, the panels were rinsed and brushed to free them of paint stripper residue. The panels were then recleaned in boiling C.P. isopropanol and C.P. benzene and immediately weighed. The panels were then examined for discoloration and evidence of corrosion.

All aluminum panels and the cadmium plated 4130C steel panels were exposed to salt spray in accordance with method 811.1 of Federal Test Method Standard 151, using a 20% salt solution. Three identical panels of each group were also exposed as controls.

The panels were allowed to remain in the salt spray until corrosion developed on either the panels exposed to a paint stripper or the controls. The panels were then compared with the controls to determine the effect of the paint strippers on the corrosion resistant properties of the chemical surface treatments or plating.

Three unnotched tensile specimens were pulled to determine tensile strength, yield strength, percent reduction in area, and percent elongation

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FINAL REPORT**3. TESTING PROCEDURE**

in 1.0" gage length. The strain rate was 0.005 in/in/minute to yield and 0.010 to 0.030 in/in/minute beyond yield.

The average notched tensile strength (NTS) was determined from 5 specimens. This value was used to load the actual test specimens.

Twenty notched tensile specimens were cleaned by boiling them one minute in C.P. isopropanol and one minute in C.P. benzene. Immediately after cleaning, ten specimens were exposed to Texo No. 502AF paint stripper at room temperature for eight hours and ten specimens were exposed to Pennsalt Cleaner No. 44 at 180F for eight hours. Immediately after exposure the specimens were rinsed to free them of paint stripper residue. Ten specimens, five treated with Texo No. 502AF and five treated with Pennsalt Cleaner No. 44 were loaded at 75% of the NTS for 100 hours and then at 90% of the NTS for 100 hours. The remaining specimens treated in paint stripper were loaded in the same manner, 24 hours after the paint stripper residue was removed.

Five untreated control specimens were loaded at 75% of the NTS for 100 hours and then at 90% of the NTS for 100 hours.

Ten notched specimens were baked at 375F for 23 hours. A second NTS value was determined from 5 of these baked specimens. Using this NTS value, the five remaining specimens were loaded to 75% of the NTS for 100 hours and then at 90% of the NTS for 100 hours.

4. TEST RESULTS

The change in weight of each panel is presented in Table 2, pages 7 through 11 of this report.

Observations of discoloration, pitting and corrosion of each panel are presented in Table 3, pages 12 through 16.

The condition of each panel as compared with the control panels after salt spray exposure, and the number of hours each panel was exposed to the salt spray are shown in Table 4, pages 17 through 19.

Tensile strength data on NTS specimens treated with paint stripper are presented in Table 5, page 20.

Tensile strength data on NTS control specimens are presented in Table 6, page 21.

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FINAL REPORT**4. TEST RESULTS (cont'd.)**

Tensile strength data of unnotched specimens are presented in Table 7, page 22.

Color photographs, Figures 2 through 10, showing the condition of all test panels after removal from the salt spray are presented in pages 24 through 32.

5. DISCUSSION OF RESULTS

The MIL-C-5541 treated aluminum panels developed a green discoloration on immersion in Pennsalt Cleaner No. 44. This was apparently due to the fact that the Pennsalt Cleaner No. 44 reduced the chromium present in the anodine.

Anodized aluminum panels exhibited a weight increase of approximately 30-50 mg on exposure to Texo No. 502AP. This weight increase was due to a residue left by the paint stripper. All attempts to remove this residue with common solvents failed. Liquitex Cleaner, manufactured and supplied by the Texo Corporation proved to be of negligible value in removing this residue.

All other weight changes on aluminum panels were slight, seldom being over 5 mg.

In general, weight increases were due to a residue being left by the paint stripper and loss of weight was due to the paint stripper attacking the panel.

In instances where the panels immersed in stripper exhibited less corrosion than the controls, an increase in weight was also noted. As a weight increase indicates a residue that was left by the paint stripper, it follows that this residue protects the panel against the corrosive effects of the salt spray environment.

Anodized bare 2024-T3 aluminum control panels failed after only 72 hours in the salt spray. To determine if the anodized panels were at fault, another group of panels, designated "5C", was tested. The control panels in this group failed after 120 hours. In both groups, the treated panels exhibited less corrosion than the controls.

Metallographic specimens of 773 specimens 7, 19, 41 and 39 were made to determine whether either paint stripper caused intergranular corrosion. Figures 11 through 14, pages 33 through 34 are photomicrographs (250X) of the failure surface. There was no apparent intergranular corrosion in any of the specimens.

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6. CONCLUSIONS

The Temo No. 502AF paint stripper is not practicable because of the residue it leaves.

The Pennsalt Cleaner No. 44 slightly impaired the corrosion-resistant properties of anodized aluminum and a definite impairment on the corrosion-resistant properties of alodine aluminum was observed. The Pennsalt Cleaner No. 44 did not change the corrosion-resistant properties of sealed and unsealed cadmium plated steel.

Neither paint stripper caused hydrogen embrittlement of high heat treated steel.

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PAGE 6REPORT AOT**FINAL REPORT****TABLE 1****PANEL MATERIAL & TREATMENT SPECIFICATIONS**

PANEL DESIGNATION	MATERIAL	SURFACE TREATMENT
3A(1 THRU 9)	ALCLAD 2024-T3 ALUMINUM	ANODIZED
3B(1 THRU 9)	ALCLAD 2024-T3 ALUMINUM	MIL-C-5541
4A(1 THRU 9)	ALCLAD 7075-T6 ALUMINUM	ANODIZED
4B(1 THRU 9)	ALCLAD 7075-T6 ALUMINUM	MIL-C-5541
5A(1 THRU 9)	BARE 2024-T3 ALUMINUM	ANODIZED
5B(1 THRU 9)	BARE 2024-T3 ALUMINUM	MIL-C-5541
5C(1 THRU 9)	BARE 2024-T3 ALUMINUM	ANODIZED *
6-(1 THRU 6)	4130 C STEEL	POLISHED
7-(1 THRU 9)	4130 C STEEL	CADMIUM PLATED
7S(1 THRU 9)	4130 C STEEL	CAD. PLATE & DICHR. MATE.
8-(1 THRU 6)	AZ31B-H24 MAGNESIUM	DOW 17
9-(1 THRU 6)	AMS 4910 TITANIUM	POLISHED
1 THRU 6	AZ31B-H24 MAGNESIUM	DICHROMATE

* SECOND GROUP

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FINAL REPORT**TABLE 2**

PANEL WEIGHT CHANGE DATA

PANEL NUMBER	WEIGHT BEFORE IMMERSION	WEIGHT AFTER IMMERSION	WEIGHT CHANGE
3A1	26.8873	26.9022	+ 0.0349
3A2	26.8923	26.9303	+ 0.0380
3A3	27.2586	27.2949	+ 0.0363
3A7	26.9485	26.9430	- 0.0055
3A8	26.9589	26.9494	- 0.0095
3A9	26.8997	26.8900	- 0.0097
3B1	26.4016	26.3998	- 0.0018
3B2	26.3512	26.3485	- 0.0027
3B3	26.4193	26.4172	- 0.0021
3B7	26.2235	26.2243	+ 0.0008
3B8	26.2670	26.2690	+ 0.0020
3B9	26.4025	26.4036	+ 0.0016
4A1	26.8236	26.8596	+ 0.0360
4A2	26.9848	27.0243	+ 0.0295
4A3	27.0507	27.0882	+ 0.0375
4A7	27.0423	27.0375	- 0.0048
4A8	27.0972	27.0905	- 0.0067
4A9	26.7620	26.7576	- 0.0044

ALL WEIGHTS ARE GIVEN IN GRAMS

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TABLE 2 CONTINUED

PANEL WEIGHT CHANGE DATA

PANEL NUMBER	WEIGHT BEFORE IMMERSION	WEIGHT AFTER IMMERSION	WEIGHT CHANGE
4 B 1	26.5056	26.5046	-0.0010
4 B 2	26.7729	26.7711	-0.0018
4 B 3	26.8449	26.8441	-0.0008
4 B 7	26.8749	26.8759	+0.0010
4 B 8	26.8333	26.8348	+0.0015
4 B 9	26.6866	26.6875	+0.0009
5 A 1	28.2606	28.3086	+0.0480
5 A 2	28.1551	28.2058	+0.0507
5 A 3	28.3910	28.4402	+0.0498
5 A 7	28.2124	28.2093	-0.0031
5 A 8	28.2303	28.2249	-0.0054
5 A 9	28.2291	28.2250	-0.0041
5 B 1	27.5230	27.5205	-0.0025
5 B 2	28.0136	28.0112	-0.0024
5 B 3	27.9631	27.9609	-0.0022
5 B 7	27.7605	27.7629	+0.0024
5 B 8	27.7766	27.7797	+0.0021
5 B 9	27.8584	27.8606	+0.0024

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PANEL NUMBER	WEIGHT BEFORE IMMERSION	WEIGHT AFTER IMMERSION	WEIGHT CHANGE
5C1	33.3524	33.3686	+0.0162
5C2	33.4837	33.4971	+0.0134
5C3	33.4748	33.4883	+0.0135
5C7	33.4181	33.4531	+0.0350
5C8	33.2353	33.2735	+0.0382
5C9	32.8749	32.9176	+0.0427
6-1	73.9873	73.9775	-0.0098
6-2	73.0310	73.0405	+0.0095
6-3	73.5135	73.5170	+0.0035
6-4	73.8659	73.9198	+0.0539
6-5	74.0046	74.0376	+0.0330
6-6	73.8349	73.8694	+0.0345
7-1	74.3102	74.3048	-0.0054
7-2	75.2278	75.2200	-0.0078
7-3	75.9719	75.9993	+0.0174
7-7	74.5208	74.5178	-0.0090
7-8	74.2854	74.3036	+0.0182
7-9	74.5449	74.5680	+0.0231

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PANEL NUMBER	WEIGHT BEFORE IMMERSION	WEIGHT AFTER IMMERSION	WEIGHT CHANGE
75 1	91.6767	91.6759	-0.0008
75 2	90.1283	90.1300	+0.0017
75 3	92.5719	92.5886	+0.0167
75 7	92.4025	92.4126	+0.0101
75 8	91.9803	91.9664	-0.0139
75 9	92.5243	92.5264	+0.0021
8-1	17.8448	17.8474	+0.0026
8-2	17.8502	17.8510	+0.0008
8-3	17.8394	17.8409	+0.0016
8-4	17.8328	17.8340	+0.0012
8-5	17.8468	17.8482	+0.0014
8-6	17.8411	17.8422	+0.0011
9-1	44.3191	44.3155	-0.0036
9-2	44.2653	44.2607	-0.0046
9-3	44.1176	44.1146	-0.0030
9-4	44.3441	44.3443	+0.0002
9-5	44.5400	44.5382	-0.0018
9-6	44.0972	44.0933	-0.0039

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PANEL WEIGHT CHANGE DATA

PANEL NUMBER	WEIGHT BEFORE IMMERSION	WEIGHT AFTER IMMERSION	WEIGHT CHANGE
1	16.9512	16.9515	+0.0003
2	16.9800	16.9811	+0.0011
3	16.9739	16.9743	+0.0004
4	16.9495	16.9488	-0.0007
5	16.9408	16.9385	-0.0023
6	16.9388	16.9387	-0.0001

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FINAL REPORT**TABLE 3****PANEL SURFACE OBSERVATIONS**

PANEL NUMBER	PAINT STRIPPER	VISUAL OBSERVATIONS AFTER IMMERSION
3A1	TEXO*502AF	NO CHANGE
3A2	"	"
3A3	"	"
3A7	PENNSALT *44	NO CHANGE
3A8	"	"
3A9	"	"
3B1	TEXO*502AF	NO CHANGE
3B2	"	"
3B3	"	"
3B7	PENNSALT *44	SLIGHT GREEN DISCOLORATION
3B8	"	"
3B9	"	"
4A1	TEXO*502AF	NO CHANGE
4A2	"	"
4A3	"	"
4A7	PENNSALT *44	NO CHANGE
4A8	"	"
4A9	"	"

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FINAL REPORT**TABLE 3 CONTINUED****PANEL SURFACE OBSERVATIONS**

PANEL NUMBER	PAINT STRIPPER	VISUAL OBSERVATIONS AFTER IMMERSION
4B1	TEXO *502AF	NO CHANGE
4B2	"	"
4B3	"	"
4B7	PENNSALT *44	SLIGHT GREEN DISCOLORATION
4B8	"	"
4B9	"	"
5A1	TEXO *502AF	NO CHANGE
5A2	"	"
5A3	"	"
5A7	PENNSALT *44	NO CHANGE
5A8	"	"
5A9	"	"
5B1	TEXO *502AF	NO CHANGE
5B2	"	"
5B3	"	"
5B7	PENNSALT *44	SLIGHT GREEN DISCOLORATION
5B8	"	"
5B9	"	"

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FINAL REPORT**TABLE 3 CONTINUED****PANEL SURFACE OBSERVATIONS**

PANEL NUMBER	PAINT STRIPPER	VISUAL OBSERVATIONS AFTER IMMERSION
5C1	PENNSALT #44	NO CHANGE
5C2	"	"
5C3	"	"
5C7	TEXO #502AF	NO CHANGE
5C8	"	"
5C9	"	"
6-1	TEXO #502AF	NO CHANGE
6-2	"	"
6-3	"	"
6-4	PENNSALT #44	LOST GLOSS
6-5	"	"
6-6	"	"
7-1	TEXO #502AF	NO CHANGE
7-2	"	"
7-3	"	"
7-7	PENNSALT #44	NO CHANGE
7-8	"	"
7-9	"	"

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PANEL NUMBER	PAINT STRIPPER	VISUAL OBSERVATIONS AFTER IMMERSION
751	PENNSALT #44	SLIGHT GREEN DISCOLORATION
752	"	"
753	"	"
757	TEXO #502AF	NO CHANGE
758	"	"
759	"	"
8-1	TEXO #502AF	NO CHANGE
8-2	"	"
8-3	"	"
8-4	PENNSALT #44	NO CHANGE
8-5	"	"
8-6	"	"
9-1	TEXO #502AF	NO CHANGE
9-2	"	"
9-3	"	"
9-4	PENNSALT #44	NO CHANGE
9-5	"	"
9-6	"	"

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PANEL SURFACE OBSERVATIONS

PANEL NUMBER	PAINT STRIPPER	VISUAL OBSERVATIONS AFTER IMMERSION
1	PENNSALT *44	NO CHANGE
2	"	"
3	"	"
4	TEXO *502AF	NO CHANGE
5	"	"
6	"	"

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TABLE 4
SALT SPRAY RESULTS

PANEL NUMBER	NO. HRS. IN SPRAY	PANEL CONDITION COMPARED TO CONTROLS
3A1	264	LESS CORROSION; SLIGHT PITTING
3A2	"	"
3A3	"	"
3A7	"	MORE CORROSION
3A8	"	"
3A9	"	"
3B1	168	LESS CORROSION
3B2	"	"
3B3	"	"
3B7	"	MORE CORROSION
3B8	"	"
3B9	"	"
4A1	264	LESS CORROSION; SLIGHT PITTING
4A2	"	"
4A3	"	"
4A7	"	MORE CORROSION
4A8	"	"
4A9	"	"

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SALT SPRAY RESULTS

PANEL NUMBER	NO. HRS. IN SPRAY	PANEL CONDITION COMPARED TO CONTROLS
4B1	168	LESS CORROSION
4B2	"	"
4B3	"	"
4B7	"	MORE CORROSION
4B8	"	"
4B9	"	"
5A1	72	MUCH LESS CORROSION
5A2	"	"
5A3	"	"
5A7	"	LESS CORROSION
5A8	"	"
5A9	"	"
5B1	168	LESS CORROSION
5B2	"	"
5B3	"	"
5B7	"	MORE CORROSION
5B8	"	"
5B9	"	"

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PAGE 19REPORT A074FINAL REPORT**TABLE 4 CONTINUED****SALT SPRAY RESULTS**

PANEL NO. HRS. NUMBER IN SPRAY	PANEL CONDITION COMPARED TO CONTROLS
5C1 120	LESS CORROSION
5C2 "	"
5C3 "	"
5C7 "	LESS CORROSION
5C8 "	"
5C9 "	"
7-1 100	NO DIFFERENCE
7-2 "	"
7-3 "	"
7-7 "	NO DIFFERENCE
7-8 "	"
7-9 "	"
7S1 144	SOME LOSS IN COLOR - NO CORROSION
7S2 "	"
7S3 "	"
7S7 "	SOME LOSS IN COLOR - NO CORROSION
7S8 "	"
7S9 "	"

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TABLE

SPECIMEN SPECIFICATIONS			STATIC LOADING			
SPECIMEN NUMBER	NOTCH DIAMETER (IN)	AREA (IN) ²	75% LOAD (LBS)	90% LOAD (LBS)	75% LOADING	90% LOADING
17	.175	.02405	6255	7508	NO FAILURE 112.2 HRS AT 75.6%	NO FAILURE 143.8 HRS
19	.175	.02405	6255	7508	112.2 HRS AT 75.6%	143.8 HRS
25	.175	.02405	6255	7506	112.2 HRS AT 75.6%	143.8 HRS
37	.175	.02405	6255	7506	112.2 HRS AT 75.6%	143.8 HRS
44	.175	.02405	6255	7508	112.2 HRS AT 75.6%	143.8 HRS
41	.168	.02212	6255	7506	NO FAILURE 94 HRS AT 82.2%	NO FAILURE .1 HRS
5	.171	.02292	6255	7506	94 HRS AT 79.3%	.15 HRS
18	.172	.02322	6255	7506	94 HRS AT 78.3%	.3 HRS
30	.1725	.02334	6255	7506	94 HRS AT 77.8%	.35 HRS
13	.173	.02350	6255	7506	94 HRS AT 77.3%	.25 HRS
22	.173	.02350	6255	7580	NO FAILURE 95.5 HRS AT 77.3%	NO FAILURE 95.2 HRS
29	.174	.02376	6255	7580	95.5 HRS AT 76.5%	95.2 HRS
39	.174	.02376	6255	7580	95.5 HRS AT 76.5%	95.2 HRS
14	.175	.02405	6255	7580	95.5 HRS AT 75.6%	95.2 HRS
15	.175	.02405	6255	7580	95.5 HRS AT 75.6%	95.2 HRS
7	.176	.02432	6255	7530	NO FAILURE 99.2 HRS AT 74.7%	NO FAILURE 2.7 HRS
12	.176	.02432	6255	7530	99.2 HRS AT 74.7%	2.7 HRS
16	.176	.02432	6255	7530	99.2 HRS AT 74.7%	2.7 HRS
23	.176	.02432	6255	7530	99.2 HRS AT 74.7%	2.7 HRS
31	.176	.02432	6255	7530	99.2 HRS AT 74.7%	2.7 HRS

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TABLE 5

90% LOADING	DYNAMIC LOADING			SPECIMEN CONDITIONS
	% OF N.T.S. AT FAILURE	FAILING LOAD (LBS)	FAILING STRESS (PSI)	TREATMENT
NO FAILURE				
5.8 HRS. AT 90.8 %	98.4 %	8140	338,800	EXPOSED TO PENNSALT #44 FOR 8 HOURS AT 180°F AND IMMEDIATELY LOADED.
5.8 HRS. AT 90.8 %	94.6 %	7820	325,400	
5.8 HRS. AT 90.8 %	96.2 %	7960	331,000	
5.8 HRS. AT 90.8 %	99.1 %	8200	341,000	
3.8 HRS. AT 90.8 %	99.1 %	8200	341,000	
FAILED				
1 HRS. AT 98.5 %				EXPOSED TO PENNSALT #44 FOR 8 HOURS AT 180°F AND LOADED 24 HOURS AFTER REMOVAL.
5 HRS. AT 95.0 %				
3 HRS. AT 93.9 %				
35 HRS. AT 93.3 %				
25 HRS. AT 92.8 %				
NO FAILURE				
2 HRS. AT 91.2 %	91.6 %	7400	315,000	EXPOSED TO TEXO #502AF FOR 8 HOURS AT ROOM TEMPERATURE AND IMMEDIATELY LOADED.
2 HRS. AT 90.2 %	98.8 %	8080	340,000	
2 HRS. AT 90.2 %	98.2 %	8040	338,000	
2 HRS. AT 89.1 %	100.7 %	8340	347,000	
2 HRS. AT 89.1 %	91.3 %	7560	314,500	
FAILED				
7 HRS. AT 90.0 %				EXPOSED TO TEXO #502AF FOR 8 HOURS AT ROOM TEMPERATURE AND LOADED 24 HOURS AFTER REMOVAL.
7 HRS. AT 90.0 %				
7 HRS. AT 90.0 %				
7 HRS. AT 90.0 %				
7 HRS. AT 90.0 %				

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IC LOADING		SPECIMEN CONDITIONS	
	FAILING LOAD (LBS)	FAILING STRESS (PSI)	TREATMENT
	8140 7820 7960 8200 8200	338,800 325,400 331,000 341,000 341,000	EXPOSED TO PENNSALT #44 FOR 8 HOURS AT 180°F AND IMMEDIATELY LOADED.
			EXPOSED TO PENNSALT #44 FOR 8 HOURS AT 180°F AND LOADED 24 HOURS AFTER REMOVAL.
	7400 8080 8040 8340 7560	315,000 340,000 338,000 347,000 314,500	EXPOSED TO TEXO #502AF FOR 8 HOURS AT ROOM TEMPERATURE AND IMMEDIATELY LOADED.
			EXPOSED TO TEXO #502AF FOR 8 HOURS AT ROOM TEMPERATURE AND LOADED 24 HOURS AFTER REMOVAL.

DATE _____

REVISED _____

REVISED _____

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TABLE 6

SPECIMEN SPECIFICATIONS			STATIC LOADING	
SPECIMEN NUMBER	NOTCH DIAMETER (IN.)	AREA (IN.) ²	75% LOADING	90% LOADING
2	.175	.02405		
3	.175	.02405		
4	.176	.02432		
5	.175	.02405		
11	.177	.02460		
AVERAGE N.T.S. VALUE = 344,200				
22	.1775	.02472		
27	.1795	.02528		
35	.178	.02488		
AVERAGE N.T.S. VALUE = 333,470			NO FAILURE	FAILED
33	.177	.02450	98.7 HRS. AT 74.7%	54.9 HRS. AT
36	.176	.02432	98.7 HRS. AT 74.7%	54.9 HRS. AT
38	.176	.02432	98.7 HRS. AT 74.7%	44.3 HRS. AT
42	.176	.02432	98.7 HRS. AT 74.7%	
45	.176	.02432	98.7 HRS. AT 74.7%	54.9 HRS. AT
8	.178	.02488	NO FAILURE 99.8 HRS. AT 75.3%	NO FAILURE 112 HRS. AT
10	.178	.02488	99.8 HRS. AT 75.3%	112 HRS. AT
20	.178	.02488	99.8 HRS. AT 75.3%	112 HRS. AT
24	.178	.02488	99.8 HRS. AT 75.3%	112 HRS. AT
28	.178	.02488	99.8 HRS. AT 75.3%	112 HRS. AT

* GRID FAILURE ON LOADING TO 89.7% N.T.S.

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DYNAMIC LOADING			SPECIMEN CONDITIONS
LOADING	FAILING LOAD (LBS)	FAILING STRESS (PSI)	TREATMENT
	8220 8280 8420 8460 8280	342,000 344,300 346,100 351,800 336,800	NO TREATMENT; THESE SPECIMENS PULLED FOR NOTCHED TENSILE STRENGTH (N.T.S.) VALUES.
	8340 8440 8200	337,300 333,800 329,300	BAKED FOR 23 HOURS AT 375°F. PULLED FOR N.T.S. VALUES
ED AT 88.7% AT 89.7% T 89.7% - 89.7%			NO TREATMENT; USED AS CONTROLS
URE 89.7% 89.7% 89.7% 89.7% 89.7%	8020 8200 8080 7980 7840	322,300(96.7%NTS) 329,200(98.7%NTS) 324,800(97.4%NTS) 320,800(96.3%NTS) 313,000(94.4%NTS)	BAKED FOR 23 HOURS AT 375°F AND LOADED FOR 99.8 HOURS AT 75.3% N.T.S. AND 112 HOURS AT 89.7% N.T.S. SPECIMENS WERE THEN PULLED FOR N.T.S. VALUES

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SPECIMEN CONDITIONS

TREATMENT

NO TREATMENT; THESE SPECIMENS
PULLED FOR NOTCHED TENSILE STRENGTH
(N.T.S.) VALUES.

BAKED FOR 23 HOURS AT 375°F. PULLED
FOR N.T.S. VALUES

NO TREATMENT; USED AS CONTROLS

BAKED FOR 23 HOURS AT 375°F AND LOADED
FOR 99.8 HOURS AT 75.3% N.T.S. AND 112 HOURS
AT 89.7% N.T.S. SPECIMENS WERE THEN
PULLED FOR N.T.S. VALUES

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LABORATORY REPORT

DATE _____

REVISED _____

REVISED _____

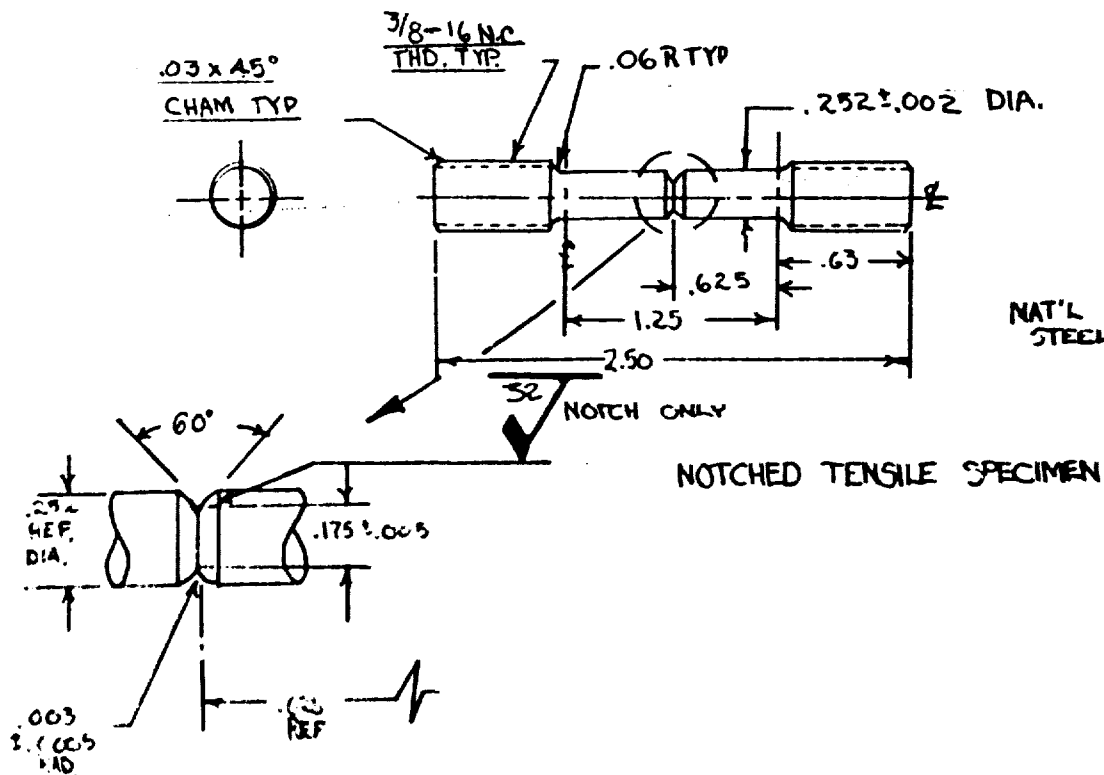
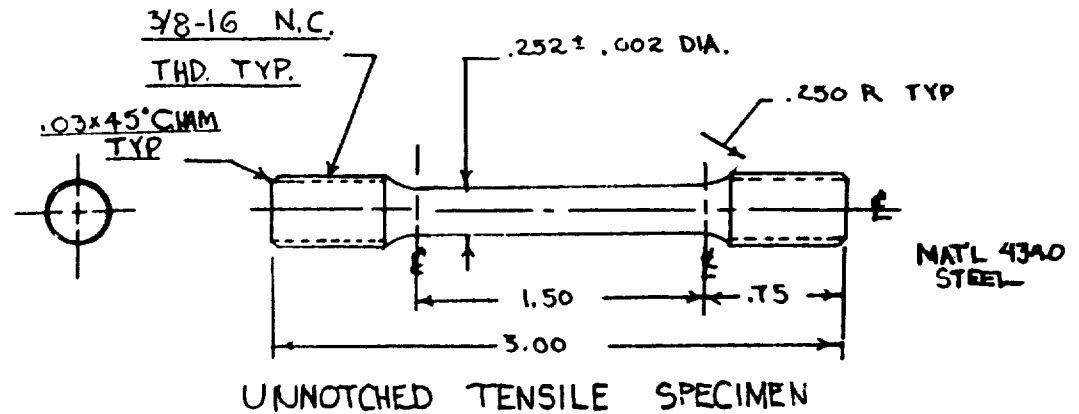
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TABLE 7

UNNOTCHED TENSILE SPECIMEN RESULTS

SPECIMEN NUMBER	TENSILE STRENGTH	YIELD STRENGTH	GAGE LENGTH	% ELON- GATION	% REDUCTION IN AREA
1	280,000 PSI	230,500 PSI	1.0 IN.	11	34.1
2	281,000 PSI	236,000 PSI	1.0 IN.	13	32.9
3	279,500 PSI	231,000 PSI	1.0 IN.	12.5	37.5

FIGURE 1



PAINT STRIPPER PANELS
AFTER SALT SPRAY
CORROSION TEST
ANODIZED 2024-T3
ALCLAD ALUMINUM
TEST LENGTH- 264 HRS.

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TEXO # 502 AF

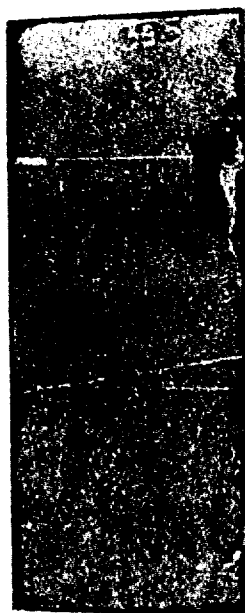
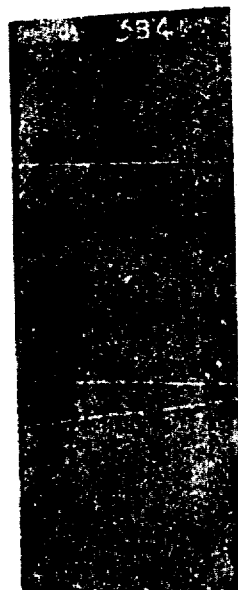
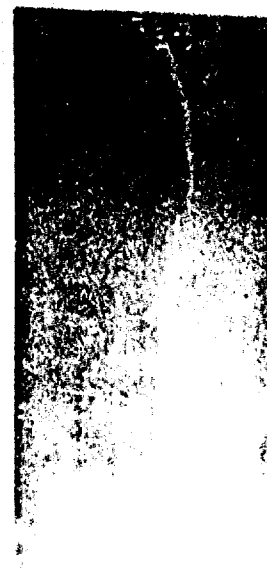
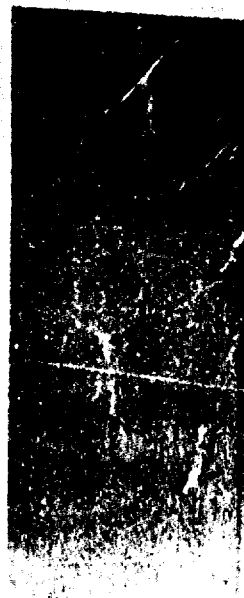
CONTROL

PENNSALT #44

PAINT STRIPPER PANELS AFTER SALT SPRAY CORROSION TEST

ALODINED 2024-T3
ALCLAD ALUMINUM

TEST LENGTH- 168HRS.



TEXO #502AF

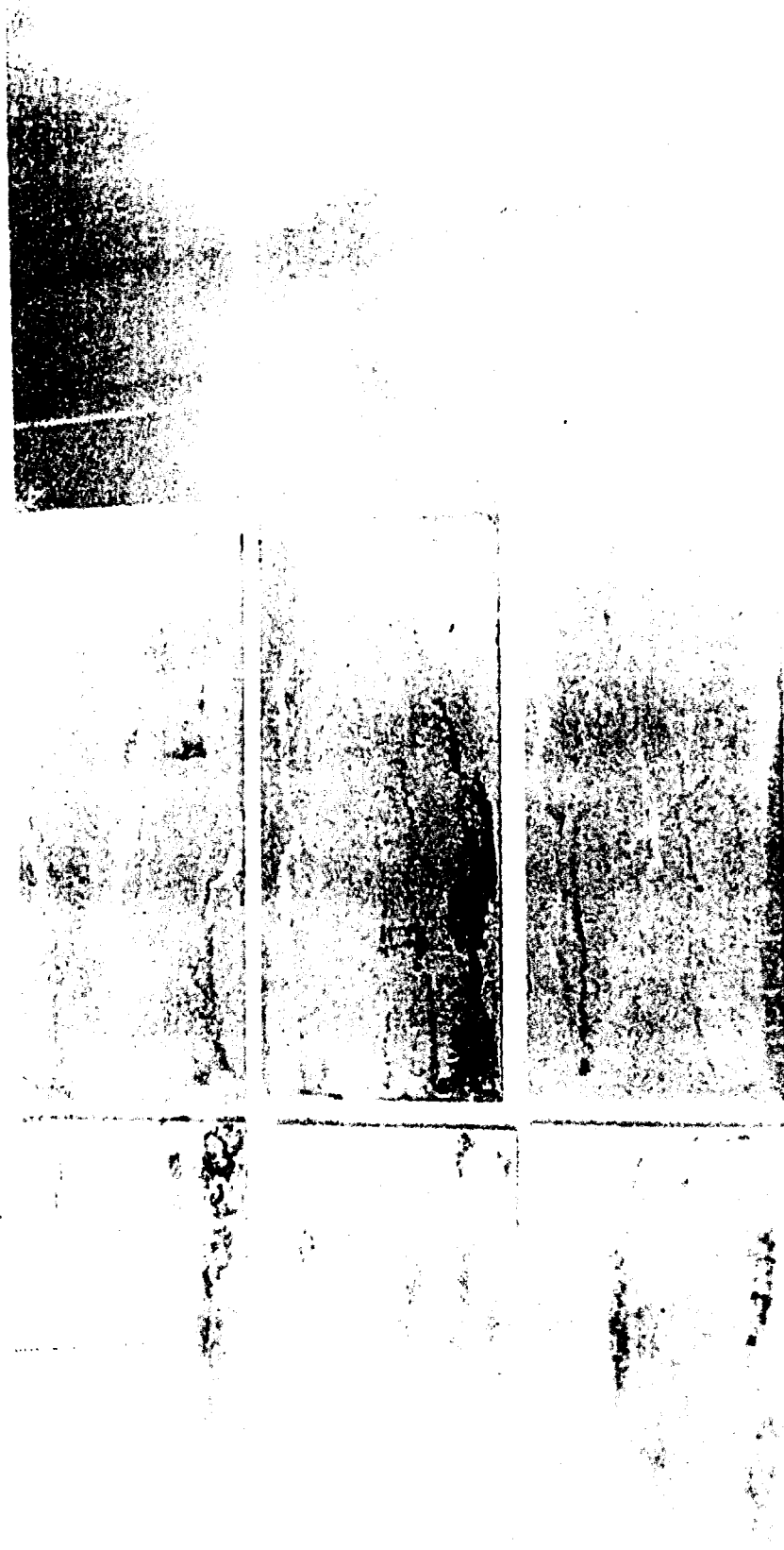
CONTROL

PENNSALT #44

Best Available Copy

FIGURE 3

PAINT STRIPPER PANELS
AFTER SALT SPRAY
CORROSION TEST
ANODIZED 7075-T6
ALCLAD ALUMINUM
TEST LENGTH-264 HRS.



PENNSALT #44

CONTROL

TEXO #502AF

PENNSALT #44

CONTROL

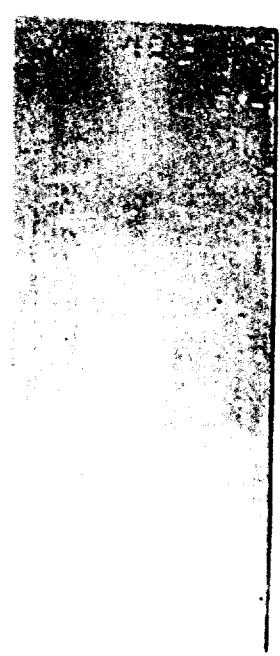
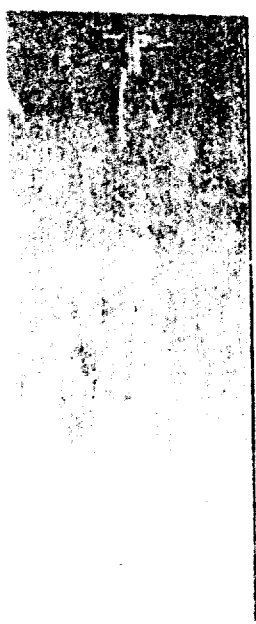
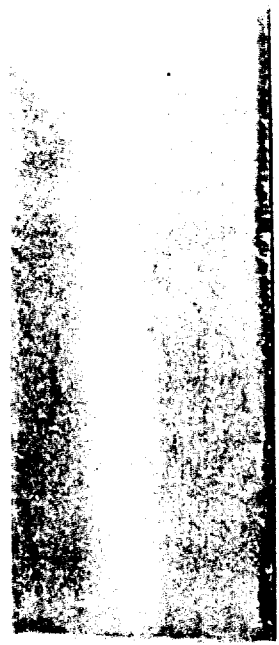
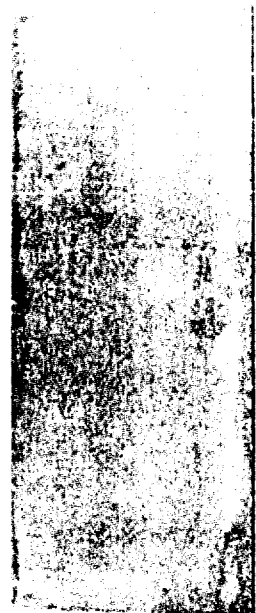
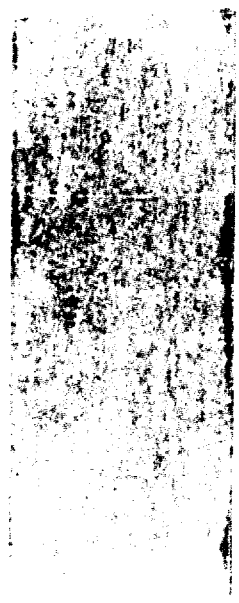
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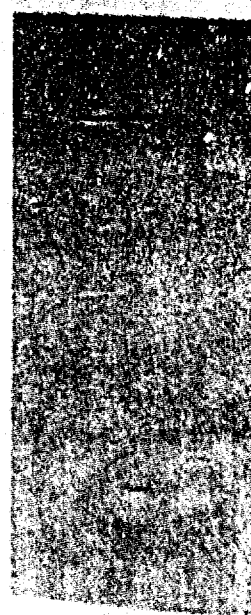
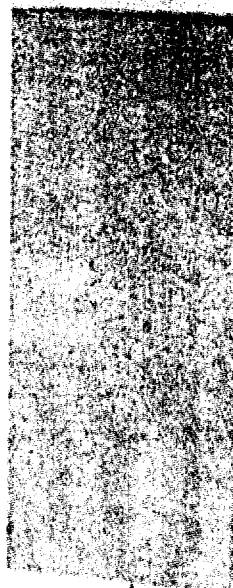
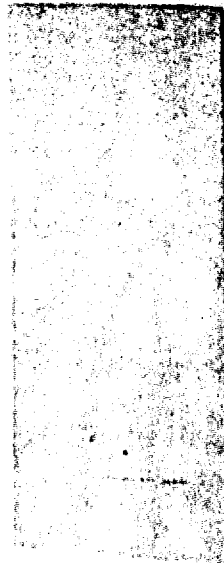
11 53 LENGTH 168HRS

ADDITIONAL



PAINT STRIPPER PANELS AFTER SALT SPRAY CORROSION TEST

ANODIZED 2024-T3
BARE ALUMINUM
TEST LENGTH-72 HRS.



TEXO #502 AF

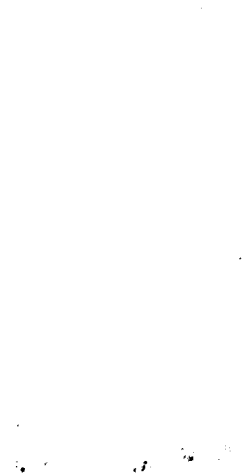
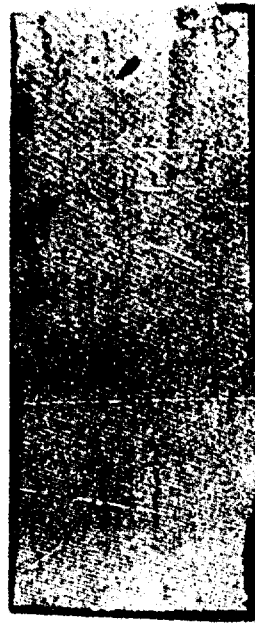
CONTROL

PENNSALT #44

PAINT STRIPPER PANELS AFTER SALT SPRAY CORROSION TEST

ALODINED 2024-T3
BARE ALUMINUM

TEST LENGTH- 168HRS.



TEXO #502AF

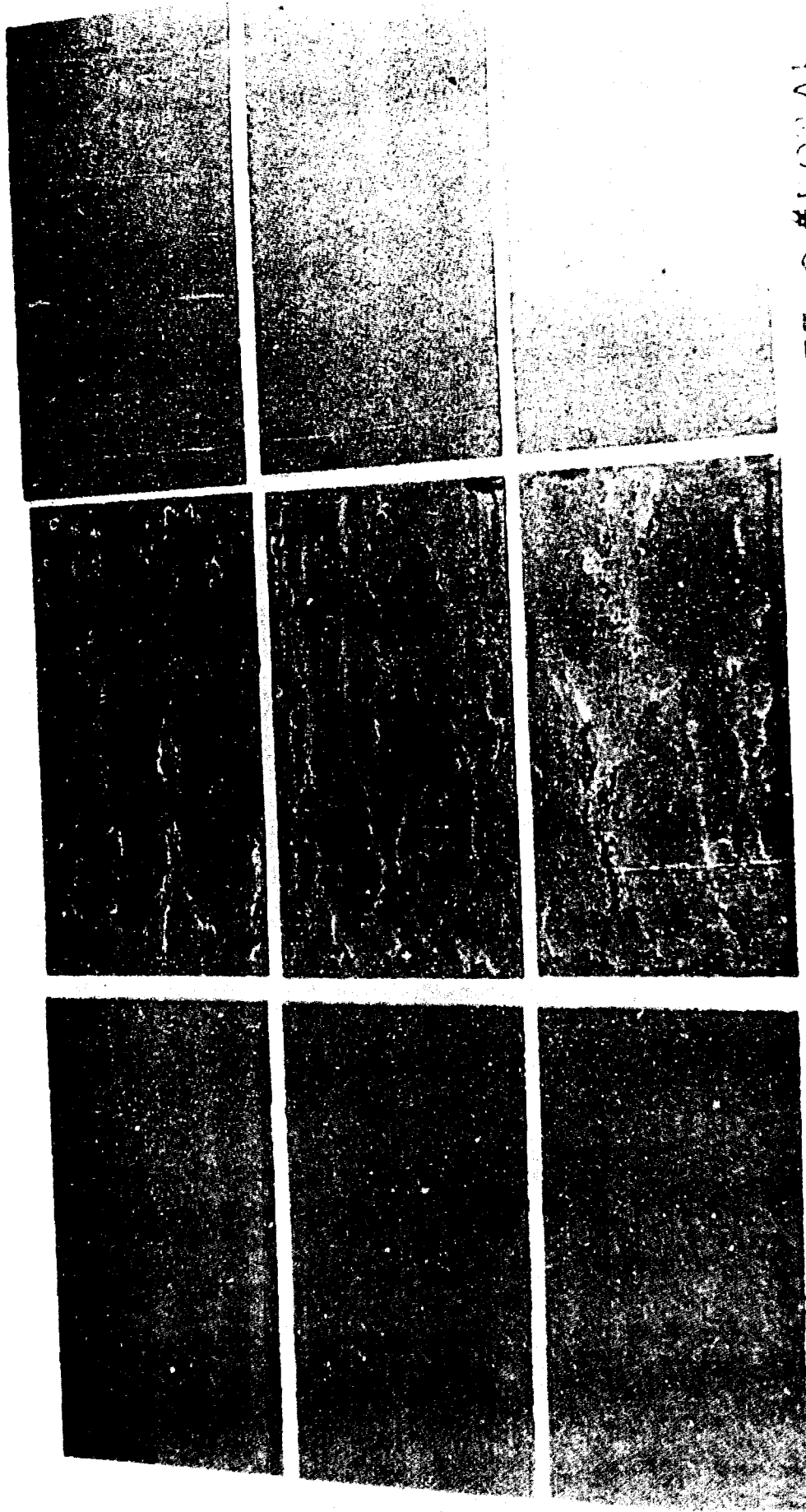
CONTROL

FIGURE 7 Best Available Copy

PENNSALT #44

PAINT STRIPPER PANELS
AFTER SALT SPRAY
CORROSION TEST

ANODIZED 2024-T3
BARE ALUMINUM
TEST LENGTH- 120 HRS.



TEXO #507 Al

CONTROL
FIGURE 8

PENNSALT #44

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PAINT STRIPPER PANELS
 AFTER SALT SPRAY
 CORROSION TEST
 CADMIUM PLATED
 4130C STEEL
 TESTING TIME-100 HRS.



PENNSALT #44



CONTROL



TEXO #502 AF

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FIGURE 9

PAINT STRIPPER PANELS
AFTER SALT SPRAY
CORROSION TEST

CADMIUM PLATED &
DICHROMATED 4130C
STEEL

TEST LENGTH- 144 HRS.



TEXO #502AF CONTROL PENNSALT #44

FIGURE 10

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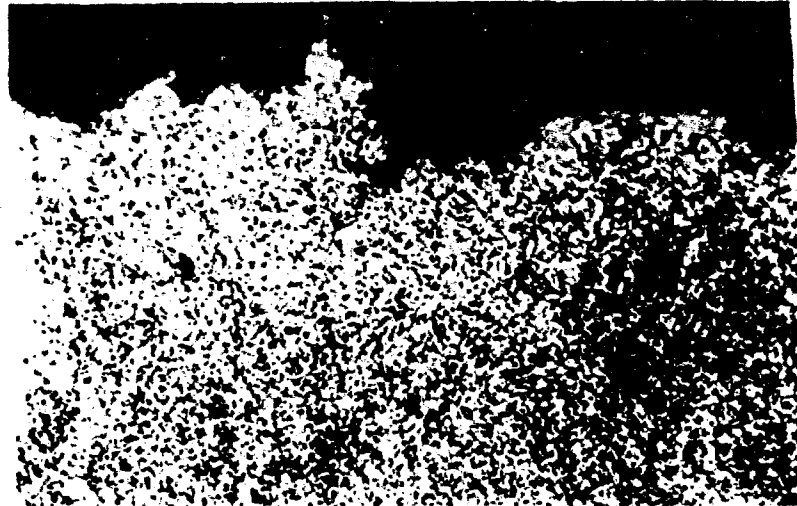
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FIGURE 11 - PHOTOMICROGRAPH (250X) OF NTS SPECIMEN EXPOSED TO TEXO NO. 1 CAP FOR EIGHT HOURS AND LOADED IMMEDIATELY AFTER REMOVAL



M-8051

FIGURE 12 - PHOTOMICROGRAPH(250X) OF NTS SPECIMEN EXPOSED TO TEXO NO. 1 CAP FOR EIGHT HOURS AND LOADED TWENTY-FOUR HOURS AFTER REMOVAL



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FIGURE 13 - PHOTOMICROGRAPH (250X) OF NTS SPECIMEN EXPOSED TO PENNSALT CLEANER NO. 44 FOR EIGHT HOURS AND LOADED IMMEDIATELY AFTER REMOVAL.



M-8957

FIGURE 14 - PHOTOMICROGRAPH (250X) OF NTS SPECIMEN EXPOSED TO PENNSALT CLEANER NO. 44 FOR EIGHT HOURS AND LOADED 24 HOURS AFTER REMOVAL



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PAGE 1 OF 6

TEST REQUEST

TITLE Effects of Texo # 502AF and Pennsalt Cleaner #44Paint Strippers on Commonly Used Aircraft Materials

LABORATORY OR DEPT. RESPONSIBLE FOR TEST

DEPT 252 RRF/EMP 1-5-62

MODEL

TEST PARTS ON IBM ☐ ON TPL NO. _____

APL/EMI

PRODUCTION PARTS FOR TEST NOT REQUIRED ☐

WORK REQUESTED

OBJECTIVE

(GIVE PURPOSE OF TEST, WORK AND DATA REQUIRED,
INCLUDING SERVICE HISTORY AND BACKGROUND INFORMATION)

Revision "A" - Revised pages 1 and 2 to add

- 1.0 OBJECT RRF/EMP Dow 17 protective coating to
3-1462/EMP the group of coatings being tested.

To determine if "Texo # 502AF" or Pennsalt Cleaner #44 are corrosive to commonly used aircraft materials, adversely affect the chemical surface treatments or platings, or cause hydrogen embrittlement of high heat treated steel.

2.0 HISTORY

Presently the epoxy paint being used on F4H detail parts is being stripped by hand. Due to increased epoxy paint requirements, tank stripping operations are urgently needed to eliminate costly hand stripping. Therefore it is necessary to determine if the paint strippers have any deleterious effects on materials which they will contact.

3.0 MATERIALS

- 3.1 Texo #502AF Paint Stripper - 2 gallons from Texo Corp. (To be provided by Dept. 272)
- 3.2 Pennsalt Cleaner #44 Paint Stripper - 5 pounds required from Pennsalt Chemical Co.
- 3.3 Eighteen 2.5 x 6.0 x .040 pieces of Alclad 2024-T3 aluminum alloy. Nine of these pieces shall be anodized per P.S. 13201 (Class A) and the other nine pieces shall be MIL-C-5541 treated per P.S. 13209.
- 3.4 Eighteen 2.5 x 6.0 x .040 pieces of Alclad 7075-T6 aluminum alloy. Nine of these pieces shall be anodized per P.S. 13201 (Class A) and the other nine pieces shall be MIL-C-5541 treated per P.S. 13209.

REP "B" ADDS 80 MM/H TO D. 252C

IDEP REPORT REQD.

REFERENCES OR ENCLOSURES
TR 032-914

1-5-62

J.S. BROOKS
PER TELECON
5-1-62

3.0 MATERIALS (Continued)

- 3.5 Eighteen 2.5 x 6.0 x .040 pieces of bare 2024-T3 aluminum alloy. Nine of these pieces shall be anodized per P.S. 13201 (Class A) and the other nine pieces shall be MIL-C-5541 treated per P.S. 13209.
- 3.6 Six 2.5 x 6.0 x .040 pieces of 4130 steel heat treated to 150,000-180,000 psi. Pickle per P.S. 12050 to remove scale and polish on a buffing wheel.
- 3.7 Nine 2.5 x 6.0 x .040 pieces of 4130 steel, cadmium plated per P.S. 13101, Type II, Class 2.
- 3.8 Six 2.5 x 6.0 x .040 pieces of AZ31B-H24 magnesium, dichromate treated per P.S. 13203, Type III.
- 3.9 Six 2.5 x 6.0 x .040 pieces of AMS 4910 (5Al.-2.5Sn) annealed titanium. Pickle per P.S. 12050 to remove scale and polish on a buffing wheel.
- 3.10 Twelve feet of 1/2" diameter 4340 annealed steel rod.
- 3.11 Six 2.5 x 6.0 x .040 pieces of AZ31B-H24 magnesium, Dow-17 treated per P.S. 13217, Type I.
- 4.0 PROCEDURE

- 4.1 Rough machine ~~81~~ blanks per Figure 1 and ~~forty five~~ blanks per Figure 2. After machining, heat treat all blanks to 260KSI to 280KSI per P.S. 15300. After heat treating, finish machine specimens per Figure 3 and Figure 4. (Note: Determine materials ability to harden before machining blanks).

4.2 Texo #502AF Test Panels

- 4.2.1 The following panels shown in Table I shall be cleaned by boiling 1 minute in C.P. isopropanol and 1 minute in C.P. benzene.

Number of Panels	Material	Surface Treatment	Material Item No.
3	Alclad 2024-T3 AL.	Anodize	3.3
3	Alclad 2024-T3 AL.	MIL-C-5541	3.3
3	Alclad 7075-T6 AL.	Anodize	3.4
3	Alclad 7075-T6 AL.	MIL-C-5541	3.4
3	Bare 2024-T3 AL.	Anodize	3.5
3	Bare 2024-T3 AL	MIL-C-5541	3.5
3	4130 Steel (h.T. 150-180 KSI)	Polished	3.6
3	4130 Steel	Cadmium Plated	3.7
3	AZ31B-H24 Magnesium	Dichromate (P.S. 13203) III	3.8
3	AZ31B-H24 Magnesium	Dow-17 (P.S. 13217) I	3.11
3	AMS 4910 Titanium	Polished	3.9

TABLE I

4.0 PROCEDURE (Continued)

- 4.2.2 Immediately after cleaning, the panels shall be weighed and the weight recorded.
- 4.2.3 All panels shown in Table I shall be completely immersed in a glass container of the Texo #502AF Paint Stripper at ROOM TEMPERATURE and allowed to remain for 8 hours. After immersion, the panels shall be rinsed under a stream of tap water and brushed, if necessary, until they are free of paint stripper residue.
- 4.2.4 The panels shall then be cleaned and weighed as specified in Para. 4.2.1 and Para. 4.2.2 above. Also the panels shall be examined for discoloration or evidence of corrosion.
- 4.2.5 All aluminum panels and the cadmium plated 4130 steel panels shown in "Table I" shall be exposed to salt spray in accordance with Method 811.1 of Fed. Test Method Std. 151 using a 20% salt solution. Three identical panels of each set cleaned per Para. 4.2.1 which have not been immersed in the paint remover shall also be exposed to the salt spray as controls. The panels shall be allowed to remain in the salt spray cabinet until corrosion develops on the panels which have been immersed in the paint stripper. After salt spray exposure, the panels shall be cleaned in tap water and the condition of the panels, previously immersed in the paint stripper, compared with the control panels to determine if the paint stripper had any detrimental effect on the corrosion protective properties of the chemical surface treatments and plating.

4.3 Pennsalt Cleaner #44 Test Panels

- 4.3.1 Starting with a new set of panels, repeat cleaning procedure per Para. 4.2.1.
- 4.3.2 Immediately after cleaning, the panels shall be weighed and the weight recorded.
- 4.3.3 These panels shall then be completely immersed in a glass container of the Pennsalt Cleaner #44 at 180°F and allowed to remain for 8 hours. After immersion, the panels shall be rinsed under a stream of tap water and brushed, if necessary, until they are free of paint stripper residue.
- 4.3.4 Repeat work requested in Para. 4.2.4.
- 4.3.5 All aluminum panels and the cadmium plated steel panels shall be exposed to salt spray per Para. 4.2.5. Since all panels (both for Texo #502AF and Pennsalt Cleaner #44 paint stripper) are to be exposed in salt spray cabinet at the same time, only one set of control panels which are called for in Para. 4.2.5 are required.

4.4 Notched Tensile Tests

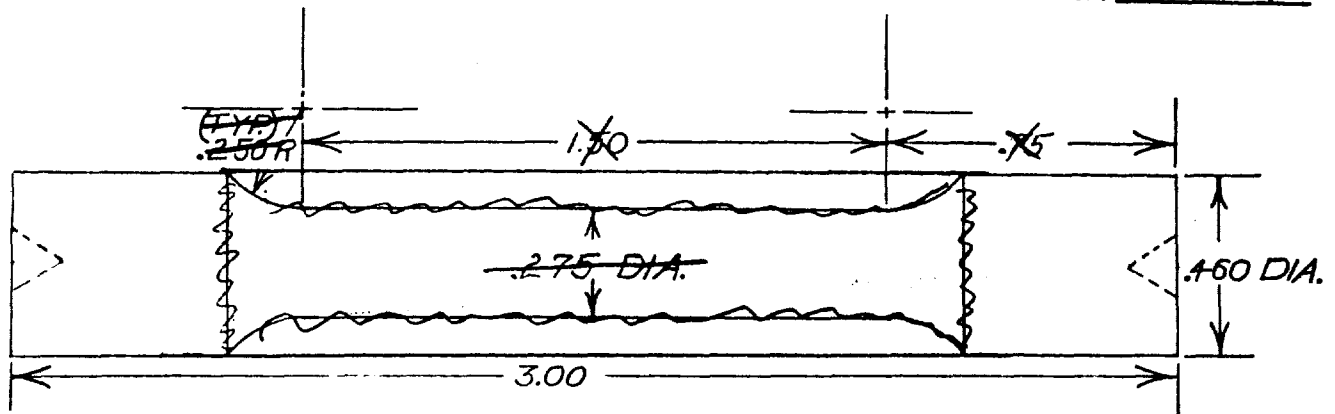
- 4.4.1 Three unnotched tensile specimens per Figure 3 shall be pulled to determine tensile strength, yield strength, percent reduction in area, and percent elongation in 1.0" gauge length. Strain rate shall be .005 in./in./minute to yield and .010 to .030 in./in./minute beyond yield.

4.0 PROCEDURE (Continued)

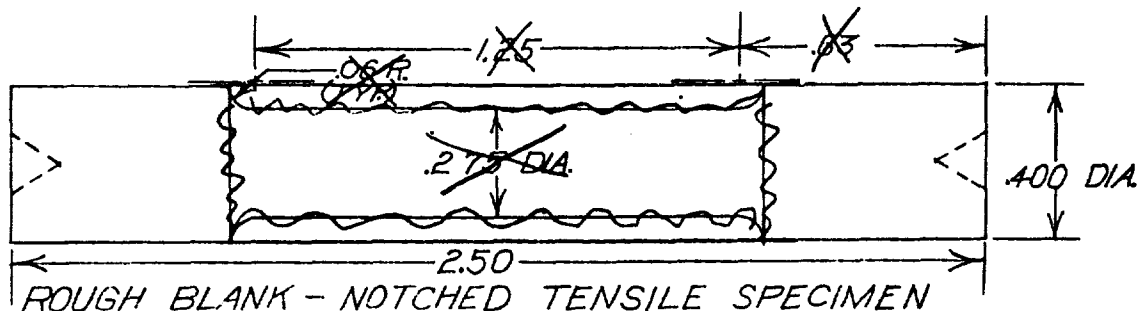
- 4.4.2 Using actual dimensions provided by "Inspection," calculate K_t value for each notch specimen.
- 4.4.3 Select ten specimens with K_t values representing the complete range of K_t values found in Para. 4.4.2. Determine N.T.S. from these selected ten specimens.
- 4.4.4 Ten notched tensile specimens shall be cleaned per Para. 4.2.1. Immediately after cleaning, five of these specimens shall be exposed to Texo #502AF paint stripper at room temperature for 8 hours. The other five specimens shall be exposed to Pennsalt Cleaner #44 at 180°F temperature for 8 hours. Immediately after exposure, specimens shall be rinsed with tap water and brushed, if necessary, until they are free of paint stripper residue. Immediately after cleaning, all ten specimens shall be loaded at 75% of the N.T.S. for 100 hours and then to 90% of the N.T.S. for 100 hours.
- 4.4.5 Ten specimens are to be cleaned, exposed, recleaned, and loaded per Para. 4.4.4. except loading shall start 24 hours after the paint stripper residue is removed.
- 4.4.6 Five control specimens shall be loaded at 75% of the N.T.S. for 100 hours and then to 90% of the N.T.S. for 100 hours.
- 4.4.7 Five additional notched tensile control specimens shall be baked at 375°F \pm 10° for 23 hours prior to loading and loaded to 75% N.T.S. for 100 hours and then to 90% N.T.S. for 100 hours.

5.0 DATA REQUIRED

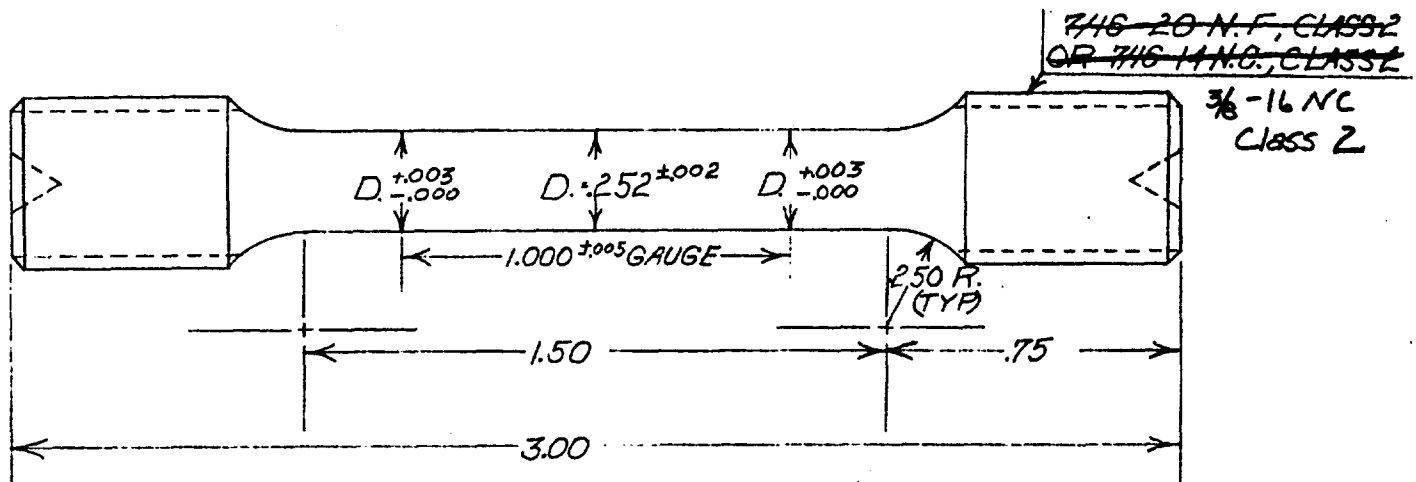
- 5.1 Report the weight loss of each panel and any discoloration, pitting, or any other indication of corrosion after the eight hours immersions of panels in Texo #502AF or Pennsalt Cleaner #44 paint strippers.
- 5.2 Report the condition of each panel as compared with the control panels after salt spray exposure and the number of hours each panel was exposed to the salt spray.
- 5.3 Three color pictures showing condition of all test panels after removal from salt spray; one showing all controls, one showing panels exposed to Texo #402AF, and one showing panels exposed to Pennsalt Cleaner #44.
- 5.4 Report tensile strength, yield strength, percent reduction in area, and percent elongation in 1.0" gauge length of the three un-notched tensile specimens.
- 5.5 Report actual notch radius, notch diameter, smooth diameter, calculated value for K_t , and stress level for each notched tensile specimen.
- 5.6 Report ultimate notch tensile strength and time to failure at 75% and 90% of N.T.S. for all notched tensile specimens.
- 5.7 Report any other useful general information found during test.



ROUGH BLANK - SMOOTH TENSILE SPECIMEN
FIGURE 1

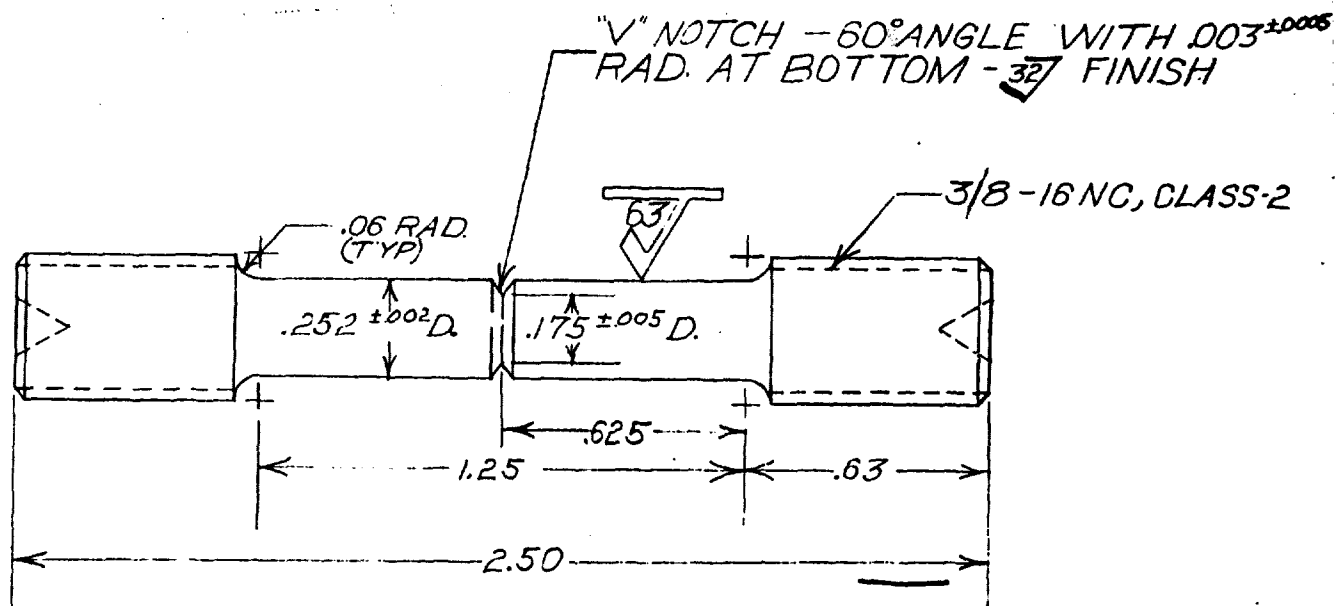


ROUGH BLANK - NOTCHED TENSILE SPECIMEN
FIGURE 2



NOTE: TAPER OPTIONAL. IF NOT TAPERED, DIAMETER OF REDUCED SECTION SHALL NOT VARY BY MORE THAN $\pm .0005$. DIAMETER AT EITHER END SHALL NOT BE LESS THAN DIAMETER AT CENTER.

SMOOTH TENSILE SPECIMEN
FIGURE 3



NOTES:

1. CONCENTRICITY WITH RESPECT TO NOTCH AND THREAD MUST BE KEPT WITHIN .001 T.I. R.
2. TOOL CHATTER, METAL TEARING, OR TOOL MARKS IN THE NOTCH WILL CAUSE REJECTION.
3. DO NOT BUFF OR GRIND NOTCH RADIUS.

FIGURE 4

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